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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/717,086

11/19/2003

Charles Q. Zhan

I20 06739US

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7590

08/23/2005

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EXAMINER

SUN, XIUQIN

ART UNIT

PAPER NUMBER

2863

DATE MAILED: 08/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/717,086

Applicant(s)

ZHAN ET AL.

Examiner

Xiuqin Sun

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 27 June 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3, 6, 7, 9, 10, 12, 13, 15, 16, 18, 19 and 22-24 is/are rejected.
- 7) ☒ Claim(s) 4, 5, 8, 11, 14, 17, 20 and 21 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 06/27/2005
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Information Disclosure Statement***

1. The information disclosure statement filed on 06/27/2005 has been received. However, the reference BB has not been considered by the examiner because it does not contain sufficient information. Specifically, BB is short of a date which is required by MPEP 609.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-3, 7, 9-10, 13, 15-16, 19 and 22-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eryurek et al. (U.S. Pub. No. 20040024568) in view of Ridolfo (U.S. Pub. No. 20030216888).

In regard to claim 1:

Eryurek et al. teach a method, comprising: identifying one or more operating characteristics associated with a valve (sections 0017-0020); identifying one or more indicators of a possible defect in the valve at a plurality of resolution levels using at least one of the one or more operating characteristics (sections 0020, 0022, 0023, 0025,

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0027, 0028 and 0039); generating a plurality of indexes associated with the resolution levels, the indexes based on the one or more indicators and each identifying a likelihood of a valve defect (sections 0027-0029); selecting one of the plurality of resolution levels using at least one of the indexes (section 0029); and determining an overall operation condition of a valve using at least one index associated with the selected resolution level (sections 0020, 0028, 0029 and 0029).

Eryurek et al. do not mention explicitly: determining an overall probability of a valve defect.

Ridolfo teaches a predictive maintenance display system, including: determining an overall probability of a valve failure using selected resolution level of sensed operating characteristics associated with the valve (sections 0081-0083).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to include the teaching of Ridolfo in the invention of Eryurek et al. in order to provide a means for determining the probability of a valve failure under a specified condition and allow the plant staff to fully explore the probability continuum (Ridolfo, Abstract and section 0082).

In regard to claims 2, 3 and 7:

The teaching of Eryurek et al. further includes: the one or more operating characteristics comprise at least one of measurements of a process variable associated with operation the valve and values generated to control the operation of the valve (sections 0017, 0021 and 0031-0034); and the one or more indicators comprise at least one of jumps in the process variable measurements and extreme positions in the

generated control values (sections 0028 and 0039); said process variable measurements comprise measurements of a flow rate of one or more materials flowing through the valve (section 0031); the generated control values comprise values used to adjust an opening of the valve and thereby adjust the flow rate (Fig. 1 and sections 0017, 0018 and 0031); and selecting one of the resolution levels comprises selecting the resolution level having the indexes resulting in a highest likelihood of a valve defect (sections 0029-0033).

In regard to claim 9:

Eryurek et al. teach an apparatus, comprising: a memory operable store one or more operating characteristics associated with a valve (Fig. 2 and sections 0017-0020); and one or more processors (Fig. 2) collectively operable to: identify one or more indicators of a possible defect in the valve at a plurality of resolution levels using at least one of the operating characteristics (sections 0020, 0022, 0023, 0025, 0027, 0028 and 0039); generate a plurality of indexes associated with the resolution levels, the indexes based on the one or more indicators and each identifying a likelihood of a valve defect (sections 0027-0029); select one of the plurality of resolution levels using at least one of the indexes (sections 0020, 0028, 0029 and 0029).

Eryurek et al. do not mention explicitly: determine an overall probability of a valve defect using at least one index associated with the selected resolution level.

Ridolfo teaches a predictive maintenance display system, including: determining an overall probability of a valve failure using selected resolution level of sensed

operating characteristics associated with the valve (sections 0045, 0050-0052, 0063-0065 and 0081-0092).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to include the teaching of Ridolfo in the invention of Eryurek et al. in order to provide a means for determining the probability of a valve failure under a specified condition and allow the plant staff to fully explore the probability continuum (Ridolfo, Abstract and section 0082).

In regard to claims 10 and 13:

The teaching of Eryurek et al. further includes: the one or more operating characteristics comprise at least one of measurements of a process variable associated with operation the valve and values generated to control the operation of the valve (sections 0017, 0021 and 0031-0034); and the one or more indicators comprise at least one of jumps in the process variable measurements and extreme positions in the generated control values (sections 0028 and 0039); and selecting one of the resolution levels comprises selecting the resolution level having the indexes resulting in a highest likelihood of a valve defect (sections 0029-0033).

In regard to claim 15:

Eryurek et al. teach a computer program embodied on computer readable medium and operable to be executed by a processor (Fig. 2, sections 0018 and 0040), the computer program comprising computer readable program code for: identifying one or more indicators of a possible defect in a valve at a plurality of resolution levels using at least one of one or more operating characteristics associated with the valve (sections

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0017-0020, 0022, 0023, 0025, 0027, 0028 and 0039); generating a plurality indexes associated with the resolution levels, the indexes based on the one or more indicators and each identifying a likelihood of a valve defect (sections 0027-0029); selecting one of the plurality of resolution levels using at least one of the indexes (sections 0029-0031).

Eryurek et al. do not mention explicitly: determine an overall probability of a valve defect using at least one index associated with the selected resolution level.

Ridolfo teaches a predictive maintenance display system, including: determining an overall probability of a valve failure using selected resolution level of sensed operating characteristics associated with the valve (sections 0045, 0050-0052, 0063-0065 and 0081-0092).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to include the teaching of Ridolfo in the invention of Eryurek et al. in order to provide a means for determining the probability of a valve failure under a specified condition and allow the plant staff to fully explore the probability continuum (Ridolfo, Abstract and section 0082).

In regard to claims 16 and 19:

The teaching of Eryurek et al. further includes: the one or more operating characteristics comprise at least one of measurements of a process variable associated with operation the valve and values generated to control the operation of the valve (sections 0017, 0021 and 0031-0034); and the one or more indicators comprise at least one of jumps in the process variable measurements and extreme positions in the generated control values (sections 0028 and 0039); and selecting one of the resolution

levels comprises selecting the resolution level having the indexes resulting in a highest likelihood of a valve defect (sections 0029-0033).

In regard to claim 22:

Eryurek et al. teach a system, comprising: a valve (Fig. 1); a measuring device operable to generate measurements of a process variable associated with operation of the valve (sections 0017-0020); a controller operable to generate output values for adjusting the valve based on the process variable measurements (Figs. 1 and 2; sections 0017, 0018 and 0031); and a defect detector operable identify one or more indicators of a possible defect in the valve at a plurality of resolution levels using at least one of the process variable measurements and the output values (sections 0020, 0022, 0023, 0025, 0027, 0028 and 0039); generate a plurality of indexes associated with the resolution levels, the indexes based on the one or more indicators and each identifying a likelihood of a valve defect (sections 0027-0029); select one of the plurality of resolution levels using at least one of the indexes (sections 0029 and 0031-0033); and determining an overall operation condition of a valve using at least one index associated with the selected resolution level (sections 0020, 0028, 0029 and 0029).

Eryurek et al. do not mention explicitly: determine an overall probability of a valve defect using at least one index associated with the selected resolution level.

Ridolfo teaches a predictive maintenance display system, including: determining an overall probability of a valve failure using selected resolution level of sensed operating characteristics associated with the valve (sections 0045, 0050-0052, 0063-0065 and 0081-0092).



It would have been obvious to one having ordinary skill in the art at the time the invention was made to include the teaching of Ridolfo in the invention of Eryurek et al. in order to provide a means for determining the probability of a valve failure under a specified condition and allow the plant staff to fully explore the probability continuum (Ridolfo, Abstract and section 0082).

In regard to claim 23:

Eryurek et al. further teach: said defect detector forms part of the controller (Fig.2 and sections 0017-0019).

4. Claims 6, 12, 18 and 24 rejected under 35 U.S.C. 103(a) as being unpatentable over Eryurek et al. (U.S. Pub. No. 20040024568) in view of Ridolfo (U.S. Pub. No. 20030216888), as applied to claims 1, 9 and 15 above, and further in view of Abdel-Malek et al. (U.S. Pat. No. 5646600).

Eryurek et al. teaches a method and apparatus that includes the subject matter discussed above. Eryurek et al. do not mention explicitly: apply said method to detecting stick-slip type of valve defect.

Abdel-Malek et al. teach an instrument for detecting potential future failures of valves, including: using the one or more indicators to identify one or more stiction events at different resolution levels, each stiction event comprising a stick phase and a slip phase (col. 1, lines 40-65 and col. 3, lines 41-65).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the teaching of Abdel-Malek et al. with the invention of Eryurek et al. in order to provide a method for detecting stick-slip in the operation of a

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valve and using the output to predict possible defect of the valve (Abdel-Malek et al., col. 1, lines 40-65).

***Allowable Subject Matter***

5. Claims 4, 5, 8, 11, 14, 17, 20 and 21 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Reasons for Allowance***

6. The following is an examiner's statement of reasons for allowance:

The primary reason for the allowance of claims 4 and 5 is the inclusion of the claimed method steps of: grouping the wavelet coefficients at different resolution levels into groups; and identifying the jumps in the process variable measurements at the plurality of resolution levels using the groups of wavelet coefficients. It is these limitations found in each of the claims, as they are claimed in the combination that have not been found, taught or suggested by the prior art of record, which make these claims allowable over the prior art.

The primary reason for the allowance of claims 8, 14, and 20 is the inclusion of the following limitations: generating the plurality of indexes comprises identifying multiple sets of one or more stiction events using different operating characteristics and generating multiple sets of indexes using the sets of stiction events; and determining the overall probability of a valve defect comprises determining a plurality of probabilities

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associated with the sets of indexes and using the plurality of probabilities to determine the overall probability. It is these limitations found in each of the claims, as they are claimed in the combination that have not been found, taught or suggested by the prior art of record, which make these claims allowable over the prior art.

The primary reason for the allowance of claims 11 and 17 is the inclusion of the following limitations: grouping the wavelet coefficients at different resolution levels into groups; identifying the jumps in the process variable measurements at the plurality of resolution levels using the groups of wavelet coefficients; and identifying the extreme positions the generated control values using number of jumps the process variable measurements at each of the resolution levels. It is these limitations found in each of the claims, as they are claimed in the combination that have not been found, taught or suggested by the prior art of record, which make these claims allowable over the prior art.

The primary reason for the allowance of claim 21 is the inclusion of the following limitation: comprising computer readable program code for classifying the overall probability into one of a plurality of classifications. It is this limitation found in the claim, as it is claimed in the combination that has not been found, taught or suggested by the prior art of record, which makes this claim allowable over the prior art.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Conclusion***

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

### ***Response to Arguments***

8. Applicant's arguments received 6/27/2005 with respect to claims 1-3, 6, 7, 9, 10, 12, 13, 15, 16, 18, 19 and 22-24 have been considered but they are not persuasive.

Applicants argued that "Eryurek never recites that a 'plurality of indexes' are generated for the decomposition levels, where one of the decomposition levels is selected using one or more of the 'plurality of indexes'". The Examiner's position is that, given its broadest reasonable interpretation, Eryurek expressly teaches this limitation. Specifically, Eryurek discloses a signal processor that is configured to perform wavelet analysis to isolate signal components related to possible defects in a component of a

process control system. Based on existing knowledge about the system, one can isolate signal components with desired frequencies or other signal characteristics to identify equipment defects at different decomposition levels corresponding to different resolution levels of the system (Eryurek, section 0022). In particular, an indication of their identification is provided on an isolated signal output (Eryurek, section 0022). In view of these teachings, one can read on: ".....seven decomposition levels labeled level 1 through level 7" (Eryurek, section 0027, lines 1-4) as the teaching of "plurality of indexes" generated for the decomposition levels; and "Components,  $X_1$ ,  $X_2$ ,  $X_3$ ,  $X_4$ ...  $X_N$  are isolated ....." (Eryurek, section 0029, lines 12-13), "..... component  $X_2$  can comprise signal components of the process variable sensor signal between 45 and 55 Hz. .... which can indicate that a pump, for example, in the process is failing" (Eryurek, section 0029, lines 28-34) as the teaching of the limitation that one of the decomposition levels is selected using one or more of the "plurality of indexes".

Applicants further argued that "..... the proposed Eryurek-Ridolfo combination fails to disclose, teach, or suggest determining an 'overall probability of a valve defect' using 'at least one of the indexes that is associated with the selected resolution level' as recited in Claims 1, 9, 15 and 22". The Examiner's position is that, given its broadest reasonable interpretation, the Eryurek-Ridolfo combination expressly discloses this limitation. As discussed above, Eryurek teaches the isolation of desired signal components that are associated with selected resolution level, identified by their corresponding wavelet decomposition level numbers. Eryurek does not disclose determining an overall probability of said defect. Ridolfo teaches a predictive

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maintenance display system, including determining an overall probability of a valve failure using selected resolution level of sensed operating characteristics associated with the valve (sections 0045, 0050-0052, 0063-0065 and 0081-0092). It is deemed that the combined teachings of the Eryurek and Ridolfo would have suggested to those of ordinary skill in the art a method for identifying defective valves including a step of determining an overall probability of a valve defect using at least one of the indexes that is associated with the selected resolution level. The mere application of a known technique to a specific instance by those skilled in the art would have been obvious.

As to claim 24, the Examiner's position is that, as illustrated above, the combination of Eryurek and Ridolfo teaches a method and apparatus for determining overall probability of a valve defect using one or more indexes that is associated with the characteristics of the valve operation. The combination does not disclose expressly to apply said method to detecting stick-slip type of valve defect. Abdel-Malek teaches the limitation of using one or more indicators to identify one or more stiction events at different resolution levels (Abdel-Malek et al. col. 1, lines 40-65 and col. 3, lines 41-65). It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the teaching of Abdel-Malek et al. with the invention of Eryurek et al. in order to provide a method for detecting stick-slip in the operation of a valve and using the output to predict possible defect of the valve (Abdel-Malek et al., col. 1, lines 40-65).

**Contact Information**

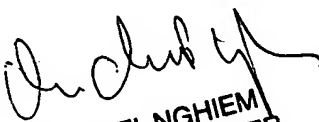
9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Xiuqin Sun whose telephone number is (571)272-2280. The examiner can normally be reached on 6:30am-4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Barlow can be reached on (571)272-2269. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Xiuqin Sun  
Examiner  
Art Unit 2863

XS  
August 19, 2005

  
MICHAEL NGHIEM  
PRIMARY EXAMINER